VISION

An object-oriented environment for computer vision and pattern recognition

VISION is an object-oriented programming environment for solving problems that require sophisticated integration of signal and image processing, computer vision, and pattern-recognition techniques.

Capabilities

The VISION system consists of a collection of classes and generic functions that perform basic signal- and image-processing tasks, such as mathematical operations, Fourier analysis, filtering, and statistical operations. It also includes low- and mid-level image-analysis capabilities such as automatic thresholding, edge detection, region segmentation, and feature extraction for two- or three-dimensional data. Several statistical pattern-recognition algorithms are provided for clustering data, selecting features, and classifying patterns, including k-means, branch-and-bound, and nearest-neighbor. VISION also has several supervised and unsupervised neural networks, such as back-propagation, probabilistic, and Kohonen self-organizing neural networks, and it provides pseudo-color one-, two-, and three-dimensional graphics.

APPLICATIONS

- *Signal and image processing*
- *Low- and mid-level computer vision*
- *Statistical pattern recognition*
- *Neural networks*
- *Graphics*
- *Object-oriented programming (CLOS based)*

Applications

At LLNL, we are using VISION for autonomous sorting of hazardous waste, for sensor fusion to evaluate sensors that can locate buried objects, and for seismic event detection and classification. We are also using VISION as a development environment to prototype real-time algorithms for tracking moving objects and for web inspection. Other applications might include medical diagnosis and the inspection and assembly of industrial parts.

Current research

In our current research, we are adding capabilities to the VISION system so it can analyze shapes from 2-1/2 views (range data) and thus can be used for object recognition and robotic applications. In addition, we plan to incorporate an Assumption Truth Maintenance System for high-level vision tasks, such as perceptual grouping.

Edge detection algorithm applied to a house scene.

Requirements: VISION is written in Common Lisp Object System (CLOS), and most of its low-level numerical algorithms are written in FORTRAN and C. It currently works on SUN4 workstations and requires an Allegro Common Lisp license. An X11-based window system with a color monitor is needed to display graphics.

Availability: The technology is available now, LLNL is interested in collaborating with an organization to improve VISION for use as a general-purpose development tool as well as with organizations wanting to use VISION as the foundation for developing custom systems.

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